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Greenery of the sacral monuments – unique green infrastructure in the urban area: case study Calvary in the Nitra

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Introduction

Phenomenon of the Calvaries lays mainly in their significant religious aspect, but also in the transformation of the landscape in their surroundings. They are significant dominants in the landscape and as the symbols, they are part of the historic structures representing cultural landscape of Slovakia.

Background

The Calvaries are not only the complexes of architectural elements and religious art with spiritual and symbolic content, but they are also very valuable from the greenery point of view - its spatial composition, species, symbols, visual marks (Halajová, 2002). Complexes of the Calvaries are dated back to the 18th and 19th century. They were established within the city intravilan (especially in the cemeteries, or near the parish churches), but also in the extravilan of the cities and villages, mostly at the hills. Currently, many of them became significant green areas in the urban structures or cities' periurban areas. They are linked by roads and green corridors to the green infrastructure of the city (Halajová, 2002).

Landscape with its elements has transformed to the urban vegetation, due to historical development and expansion of the cities. Nowadays it provides benefits for the society according current requirements. The pressure of population on the greenery in the city determinates different functional utilization of these objects (Bihuřová, 2006; Flekalová 2015). Many of the Calvaries offer except the religious function also the recreational and leisure possibilities. They've become places for passive recreation, staying in the nature, walks and relaxation, e.g. Calvary in Prešov, Humenné, Levoča, Banská Bystrica (Slovakia), Svatý Hostýn, Svatý Kopeček, Olomouc (Czech republic), Zebrzydowska Calvary (Poland).

Tóth, Feriancová (2015) evaluated sacral elements in the landscape, within the cadastral area of the villages. They have discovered that wooden boxes with the sculptures, paintings or pictures of Saints were fasten onto the tree's trunk in the past. They found mostly horse chestnuts (*Aesculus hippocastanum* L.) near the small sacral objects. Fornal Pienak et al. (2011) pointed at the importance of the religious heritage within the objects of the landscape and nature protection.

Sacral objects and religious complexes have legal protection in Slovakia. There is law n. 49/2002 Act about heritage protection, which enable announced the objects and areas of the cultural landscape for the national cultural heritage sides and set up their protection zones. Second law is n. 543/2002 Act about nature and landscape protection. There is also european declaration European Landscape Convention. The main aims of the Convention respond slovak environmental policy.

Goals and objectives

The article has aim to point on the importance, potential and limits of the greenery near the sacral objects. The model territory is the Calvary in Nitra city. Based on landscape-architectonical analyses and dendrology assessment were set landscape principles for suitable restoration of the functions and greenery of the Calvary.

Material and Method(s)

Calvary in Nitra is situated in the southern part of the city and became one of the main city's dominants. The first Calvary was built up in the last third of the 18th century at this place, beyond of developed area, which was typical for baroque period. Seven stations were raised in 1885, when the Chapel of Holy Cross was built up. Later was chapel modified to the Chapel of Holy Sepulchre. In the 19th century the urbanised development reached the Calvary and in 20th century Calvary was completely enclosed by built up area (Čičo et al, 2002). The area of the Calvary hill is unique also from natural point of view. It is a place, where several endemic species appear in the Spring time.

The area of the Calvary is part of the border between lowlands type of landscape and the mountainous region in the area. Human element in the past created the potent contrast between natural and anthropogenic elements, with forestall land as the original landscape type. Secondary phenomenon of the steppes on carbon soils was created by human hand after the forced deforestation of the land. The reason for that was the early settlements in the Nitra region, near the Calvary hill.



Figure 1. View from the top of Calvary



Figure 2. Bottom part of the Calvary

The anthropogenic pressure on the last remnants of the original vegetation increased furthermore and the lands without forests were facing the elements and water and rain erosion /as proofed by shallow soil cover nowadays/. The peak of overexploitation was reached by raising the stone quarry within the site. The process of urbanisation /the construction of family houses with gardens in the area/ determined the need for humanisation of the site by reforestation in 20-ties and 30-ties of the 20th Century. The reforestation was carried on in 50-ties and 60-ties of last century. Paradoxically, later on the deposit of the communal wastes was established in former stone-quarry and as such, the ecological stability of the site was damaged heavily. Today, the deposit is in the stage of revitalisation.

For the objective evaluation, have been used two types of the assessment methodologies of the area. First one (Lančarič, 2009) brings the basic information and describes the landscape value of the Calvary. Second methodology is detailed inventory of the greenery, based on two methodologies: Machovec (1987) and Juhásová (2003). This evaluation gives us detailed base for the landscape architectural proposal.

Methodology of the Calvary Assessment (Lančarič, 2009):

1. Religious and architectural aspects of the Calvary restoration: the number of Stations of the Way of Cross, Calvary program, design of the End point of the Calvary, configuration of the Stations, architectural style and morphology, materials of the architectural elements, Way of Cross themes design, current state of architectural elements, establishment period
2. Landscaping aspects of the restoration: position of the Calvary within the city structure, relief of the Calvary, type of vegetation elements, composition and condition of the vegetation elements, the significance of the Calvary in the landscape perception due to the distance of observation, vegetation species.

3. Calvary restoration from the point of view of the monument protection and nature and landscape protection: the degree of monument protection and nature and landscape conservation
4. Calvary restoration from the recreational point of view: the predominant function of the space, coexistence of the functions, recreational equipment of the Calvary surrounding, Level of connection of the Calvary to the recreational landscape, accessibility to the visitors, environmental disturbances

Assessment of the Greenery (Machovec, 1982 and Juhásová, 2009 in Hrubík et al., 2011)

Following the steps of Machovec methodology (1987), we have collected dendrometric data as: height of the tree, crown width, trunk perimeter, age. Juhásová methodology evaluates the health condition of woody plants. It consists of 5 point classification system, in which 5 points are allocated to the most damaged tree species, intended for felling. There are also detailed description of the tree damage and fungal diseases. The financial value of the trees were calculated according the law n. 543/2002 Act about the Nature and Landscape Protection and regulation n. 579/2008 Regulation of Ministry of Environment of the Slovak republic.

Results of the Calvary Assessment Methodology

The greenery of the site is partially steppes-like, with the moderate to large groups of shrubs and trees. The health condition is not optimal, the dry warm skeletal shallow soils are putting the plants under the physiological drought stress. There is some evidence of the regular maintenance, mostly in the vicinity of the Missionary Manor, the rest of the site /former communal wastes deposit especially/ without any interventions towards the increasing of the esthetical values of the greenery.

Trees - *Cerasus mahaleb* (L.) Mill. a *Ulmus minor* Mill. , *Pinus nigra* L., *Acer campestre* L., ., *Acer platanoides* L., *Robinia pseudoacacia* L., *Fraxinus excelsior* L., *Juglans regia* L.

Shrubs - *Crataegus* sp., *Sambucus* sp., *Frangula* sp., *Cornus* sp., *Rosa canina* L., *Crataegus monogyna* Jacq., *Betula nana* L. a *Acer campestre* L. , *Syringa vulgaris* L., *Rhus typhina* L., *Rubus* sp., *Potentilla* sp.

Plants and herbs - *Festuca pallens* Host, *Potentilla arenaria* Borkh., *Jovibarba sobolifera* auct. Non (Sims.) Opiz, *Sedum album* L. a *Sedum saxangulare* L., *Hesperis tristis* L. a *Xeranthemum annuum* L., *Gagea pusilla* (W. F. Schmidt)

Schult. et Schult. f. a Gagea bohémica (Zauschn.) Schult. et Schult. f., Alyssum montanum L. a Ranunculus illyricus L., Verbascum olympicum Boiss.,

The Calvary in Nitra is under the monument board protection /the entirely Calvary hill and also the solitary Stations of the Way of Cross/. The part of the site also lays within the borders of the Nitra monuments zone area.

Within the site the religious and recreational use of the area complement harmonically. There is still living annual pilgrimage tradition present in the site. During the whole year, the Calvary serves as the goal of the small walks and short time recreation. Still, the recreational facilities in the area are few. Besides the parking in front of the Missionary Manor, park benches and lighting in the “Pine forest” area, the Coffeshop and Wine bar with toilets, there are none. There is also no connection or added value to the other wide scale recreational activities in the city /e.g. the cycling routes on the riverside, etc./. The strength of the site is its good accessibility from the city centre by walking, bicycle or by car

Assessment of the greenery

Detailed inventory of the greenery were done from September till November 2015. According to the categories of the greenery, there were 47% of the urban greenery, 38% of the non-forest greenery and 15% of the forest greenery.

There were evaluated 400 woody plants, from which 224 pieces were deciduous and 176 were coniferous plants (89% were trees and 11% shrubs). From the total number of trees (356 trees) 198 pieces of deciduous trees and 158 pieces of coniferous trees were assessed. There were 15 gens and 22 species of the trees. The largest representation have *Pinus nigra* L. (44%) and *Acer platanoides* L. (18%), then were *Robinia pseudoacacia* L. (15%), *Tilia cordata* Mill. (8%), *Acer pseudoplatanus* L. (6%), *Fraxinus excelsior* L. and *Quercus robur* L. (4%). There were evaluated also *Acer campestre* L., *Acer rubrum* L., *Aesculus hippocastanum* L., *Betula nigra* L., *Castanea sativa* Mill., *Celtis occidentalis* L., *Fagus sylvatica* L., *Fraxinus Americana* L., *Fraxinus ornus* L., *Larix decidua* Mill., *Prunus domestica* L., *Prunus fruticosa* Pallas, *Tilia platyphyllos* Scop, *Cedrus deodara* D.Don and *Salix matsudana*, but they occur less than 3%.

There were evaluated 44 shrubs, with 12 gens and 14 different species. The total amount of deciduous shrubs was 26 and conifers 18 pieces.

Landscape architectural proposal

Lančarič methodology offers the base for the proposal of the restoration of the site. The Calvary in Nitra belongs to the system of the city greenery and green infrastructure. Strong demands on its recreational use could be seen, therefore it is necessary to take it in to account during the process of restoration and link it properly to the existing green infrastructure. The suitable landscape architectonical proposal could merge the religious and recreational potential of sacral sides in the harmony coexistence.

Due to detail trees and shrubs evaluation and particular analyses, it is possible to set up the landscape interventions and functional proposal for the side within the legal framework. There were proposed to cut down 144 pieces of woody plants (111 trees and 33 shrubs), because of not satisfying health conditions. There are also proposed to remove invasive species (*Robinia pseudoacacia* L., *Fraxinus* sp., *Syringa vulgaris* L.) and young trees within the 15 cm of the tree trunk perimeter. There is a necessity to accomplish maintenance service of the greenery in the forest park. Total amount of the money of the trees proposed to remove is 79 928,94 EUR (according to the Regulation n. 579/2008 to the Act n.543/2002).

The landscape concept “*Living in the wood*” was chosen as the suitable proposal for revitalisation of the site. We have proposed 3 main zones: 1. *Representative entrance zone*, 2. *Zone of leisure and recreation*, 3. *Sport zone*.

The first zone will be equipped with more benches to sit, places to stop and learn some historical facts and remarkableness of the side through the educational boards, to perceive the surroundings and views, there will be added flower beds and new plantation of the greenery.

Recreational and leisure zone will be designed as a place for the families with different activities: playgrounds, fire place, benches, and new plantation of the *Rhododendron* sp.

Sport zone offers facilities for sport, recreation, fitness activities. In this part it is necessary to make thinning and new plantation of the trees from the compositional point of view.



Figure 3. Category of the greenery and concept of the side

1 educational trail leads to the Cave of Holy Mary; 2 park design supported by flower beds, trees and with the protection of the views to the city; 3 Children playground designed by simply wooden elements; 4 Fire place and open meadow; 5 Sport/Fit trail; 6 Climbing rock



Figure 4, 5, 6. Visualisations of the proposed Sport zone, Recreational zone and Information board

Discussion

There were done several research activities regarding to the sacral objects in the urban environment with connection to the greenery – e.g. Humenné (Lančarič, Bihuřová, 2011), Mýto pod Ďumbierom (Akurátny, 2010 and 2012); rural landscape – cadastral area of Tvrdosovce (Tóth, Feriancová, 2015) and evaluation of their potential for tourism activities (Kalinová, D., Bihuřová, M., Štrba, B., 2004; Fornal Pienak et al., 2011).

The applied assessment of the chosen criteria and typology (Lančarič, 2009) shows:

The Methodology is helpful in thorough evaluation and analysis of the current state matters of the site from the different points of view /architecture, landscaping, greenery, functional use, recreational potential etc./.

The analysis creates the solid basis for the process of determination of the next steps and decision making process of the functional and actual restoration of the Calvary.

There is also element of the subjective point of view in the process of the evaluation of the site, as such not to be quantified, but having influence e.g. on the chosen method and intensity of the restoration of the site.

The main aim of the restoration according the evaluation should focus on the increasing the quality of the greenery of the site and of the landscape values as the synergy effect. Also the strengthening of the recreational facilities in the area and offer of the recreational activities for visitors should be stressed as well. Of course, the intensity of the recreational use and the offer of the recreational activities should not have negative influence on the religious aspects of the site

Conclusion

The need of human being to regenerate the physical and psychical powers determinates the recreational use of green public spaces as parks, inner yards in the city. The Calvary hill in Nitra is an important part of the city greenery network and as such has very high potential for recreation of the inhabitants, despite the fact, the current level of its architectonical, esthetical and greenery quality value is quite moderate. The perks of the area are its relief, topography and scale, which allow wide spectrum of recreational activities to different target groups of visitors.

The results of the analysis show that greenery of the Calvary has strong eco-stabile function, high recreational potential and greatly affects the image of the city. We have focused on improving the conditions of the vegetation elements in the area and tried to upgrade the recreational facilities of the site. Our proposal is stressing the religious function of the site, despite the fact some recreational functions were added. Basic principles of the Calvary restoration were set and applied in the landscape-architectonical design proposal.

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